3.1.4. LONG-TERM TRENDS

Figure 3.3 shows long-term trends in CN concentration and σ_{sp} for the baseline observatories, and Figure 3.4 shows long-term trends in $\mathring{a}$ for the baseline observatories and σ_{ap} and ω_o for BRW and MLO. The monthly means are plotted along with a linear trend line fitted to the data. At BRW, the aerosol properties exhibit an annual decrease in σ_{sp} of about 2% yr^{-1} since 1980. This reduction in aerosol scattering has been attributed to decreased anthropogenic emissions from Europe and Russia [*Bodhaine*, 1989] and is most apparent during March when the Arctic haze effect is largest. The corresponding decrease in the Ångström exponent over the same time period points to a shift in the aerosol size distribution to a larger fraction of coarse-mode seasalt aerosol. *Stone* [1997] noted a long-term increase in both surface temperatures and cloud coverage at BRW for 1965-1995 that derives from changing circulation patterns and may account for the reduction in σ_{sp} by enhanced scavenging of accumulation-mode aerosols.

In contrast to the reduction in σ_{sp} at BRW, CN concentrations, which are most sensitive to particles with diameters <0.1 μm, have increased since 1976. There is an offset in CN concentration starting in 1998 that corresponds

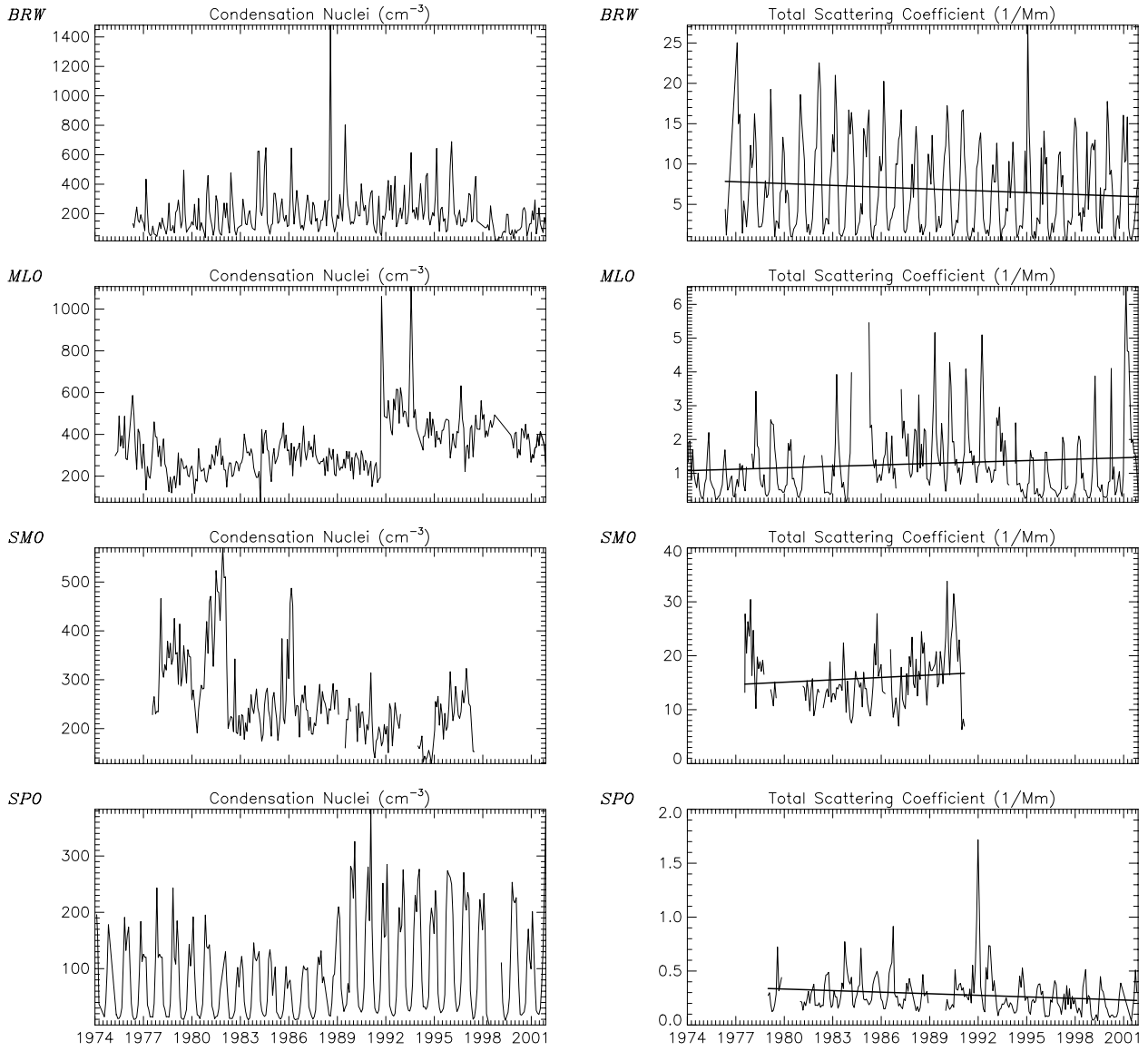

Fig. 3.3. Long-term trends for baseline stations of monthly averaged condensation nuclei concentration (left panels) and total scattering coefficient at 550 nm (right panels). A simple linear fit is given for the scattering coefficient but is omitted for the condensation nuclei because instrument changes make a trend line inappropriate.

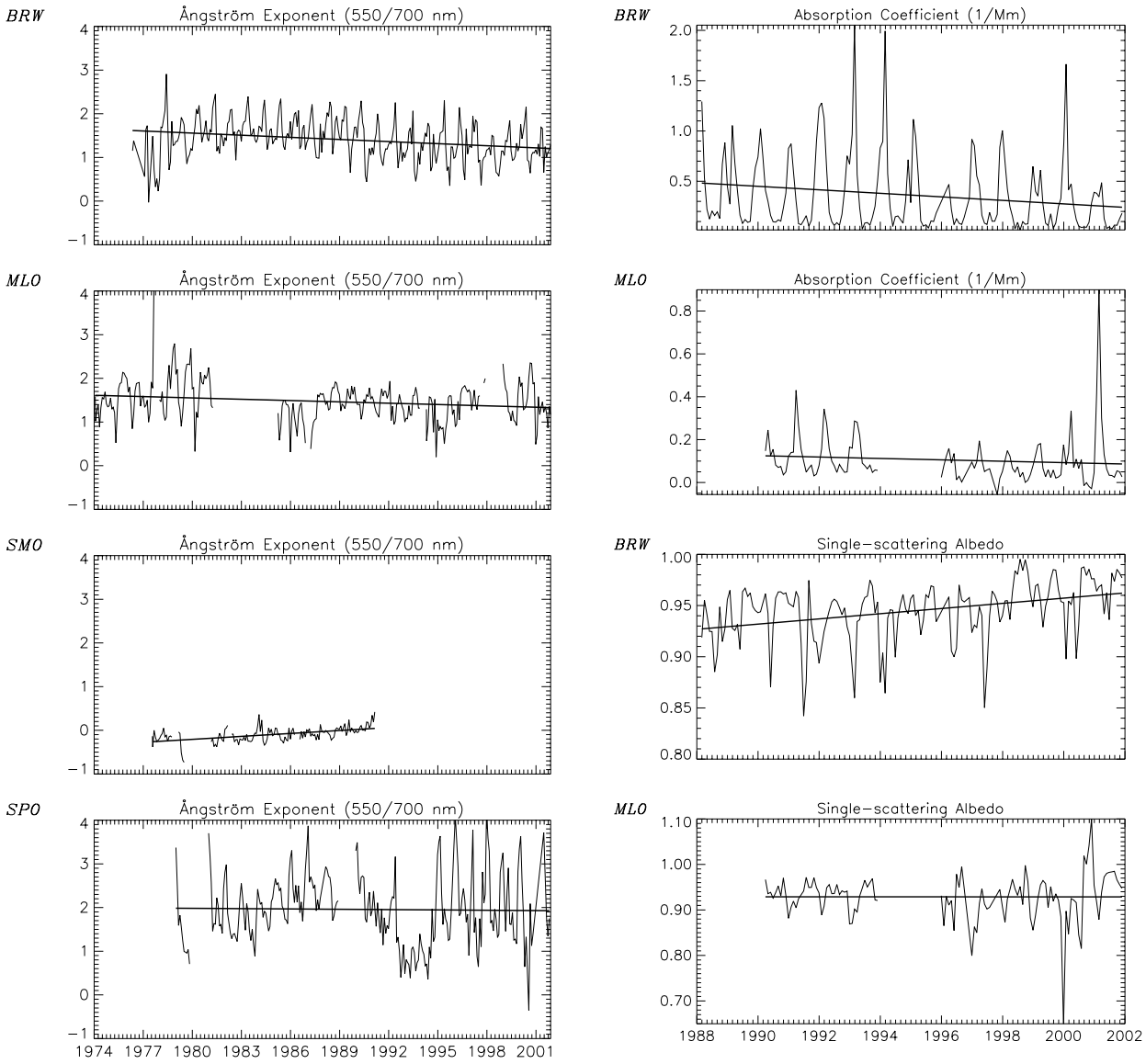

Fig. 3.4. Long-term trends for baseline stations of monthly averaged Ångström exponent (550/700 nm) (left panels); and absorption coefficient and single scattering albedo at BRW and MLO (right panels). Simple linear fits to the data are shown.

to a change to a new CN sampling inlet. Similarly, the step increases in CN concentration in late 1991 at MLO and 1989 at SPO are due to replacement of the CN counter with a butanol-based instrument with a lower size detection limit. The reason for the decrease in CN and increase in *å* at SMO is not readily apparent, but it could stem from changes in long-term circulation patterns.

Previous reports describe the aerosol data sets: for BRW, *Bodhaine* [1989, 1995]; *Quakenbush and Bodhaine* [1986]; *Bodhaine and Dutton* [1993]; *Barrie* [1996]; *Delene and Ogren* [2002]; for MLO, *Bodhaine* [1995]; *Delene and Ogren* [2002]; for SGP, *Delene and Ogren* [2002]; *Sheridan et al.* [2001]; *Bergin et al.* [2000]; for SMO, *Bodhaine and DeLuisi* [1985]; for SPO, *Bodhaine et al.* [1986, 1987, 1992]; *Bergin et al.* [1998]; and for WSA, *McInnes et al.* [1998]; *Delene and Ogren* [2002].